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ABSTRACT

The Energy Communications Center (ECC) has sponsored a number of alcohol fuels activities designed to share information about alcohol fuels with two-year college faculty and administrators and to clarify the manpower and curriculum issues related to fuel production. This paper is the result of the last of these activities, a one-day meeting of fuel experts and educators held in March 1981. After a summary of the major conclusions reached at the meeting, background information on the goals and activities of the ECC is presented, along with a listing of the March 1981 meeting participants. Next, the paper explains why the alcohol fuels industry is in flux and presents two arguments in support of American investment in the industry. These arguments relate to alcohol as a means of enhancing national security and alcohol production as a trigger for rural revitalization. Speculative figures are then presented for the future of alcohol fuel production, followed by a review of studies projecting labor requirements in the industry. The next section of the paper looks at the role of the community colleges, focusing on their function as regional training centers, a three-phase approach to program development, the implementation of this approach at State Fair College, and their responsibility to provide objective, factual details about the alcohol fuels issue to diminish community resistance. After summarizing the issues raised at the March meeting, the paper concludes with an annotated list of resources. (AYC)

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Alcohol Fuels Production, Manpower, and Education: Where Do Two-Year Colleges Fit?

American Association of Community and Junior Colleges
Energy Communications Center

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The opinions, views, and conclusions presented in this paper are solely the writer's and do not necessarily reflect those of the U.S. Department of Energy, the American Association of Community and Junior Colleges, or the participants in the March 6, 1981, Alcohol Fuels Education meeting.

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Summary

"American fuels" development has generated increasing interest in the past few years. The interest has been fostered by the painful costs of fuels and public awareness of the billions of dollars (approximately $90 billion in 1980) the United States pays for foreign oil. The potential of these domestic fuels to trigger local self-sufficiency, rural re-vitalization, and economic development has also stimulated interest in alcohol, wind, geothermal, solar, wood, methane from animal wastes and municipal sewage, and coal. Recently, the interest has been prompted by a government-sponsored report stating that our centralized production and supply system is vulnerable to destructive assaults by domestic or foreign organizations.

In the last several months, with support from the U.S. Department of Energy, AACJC's Energy Communications Center has sponsored a number of alcohol fuels activities designed to share information about alcohol fuels with two-year college faculty and administrators and to clarify the manpower and curriculum issues related to production. The series of activities was capped by a March 6, 1981, meeting held at AACJC. Representatives of two-year colleges attended with officials from national organizations speaking for alcohol fuels, manpower research, and rural America. This paper is in large measure a report of the meeting.

Major conclusions include:

- Energy issues are too important for colleges to ignore in their program offerings; each college should determine what energy focuses and what program forms make most sense for its local area.
- Community-size alcohol plants have the potential of leading the way toward local economic development and self-sufficiency.

- Production and manpower projections vary widely from one source to another. Even if the most optimistic production levels are reached, the evidence shows that there will be only a modest need for narrowly-trained alcohol fuels technicians. The most reasonable approach for colleges is to train energy generalists through curricula that focus on basic competencies in science, math, management, and communications. The curricula should address a variety of energy resource areas, with grounding in occupations in which jobs currently exist.
- If alcohol fuel production is to expand in local communities, colleges may have to assume a leadership role. An important part of this role would be to communicate reliable data about alcohol fuels to financial institutions, construction firms, and potential owners to induce plant sitings. Colleges might also lead the way in broadening the concept of alcohol fuels. In addition to its application for individual integrated energy farm systems, colleges might demonstrate its potential as a community enterprise.
- Before alcohol fuel production can expand significantly, a number of product use applications have to be developed, including gasoline- and diesel-powered engine conversion and by-product uses. Markets for the production have to be created.

Background

> **Human history becomes more and more a race between eduation and catastrophe. H. G. Wells, *The Outline of History*, 1920.**

In August 1979 the American Association of Community and Junior Colleges (AACJC) received a grant from the U.S. Department of Energy (USDOE), Office of Consumer Affairs, to establish and administer the Energy Communications Center. The Center's principal purpose was to stimulate greater two-year college energy-related activities. The Center's essential strategy was to collect and disseminate an assortment of energy information of use to colleges in introducing, improving, and expanding energy education offerings. All energy sources were to receive attention.

While one energy source was not to be stressed above others, the Center has been especially involved in alcohol fuels issues. The reason for the focus is the addition of USDOE Alcohol Fuels Office monies to the Center's basic grant. It was the opinion of USDOE officials that the most appropriate and effective means of informing local communities of the potential of alcohol fuels and of imparting reliable data about the fuel production process and alcohol uses was through locally-based colleges. A compendium of the Center's work in alcohol fuels follows:

- November 1–2, 1979: supported a national meeting of Alcohol Fuels Training Program grantees (40 postsecondary institutions, each the recipient of a $10,000 grant from USDOE to conduct alcohol fuels workshops) at Lincoln Land Community College, Springfield, Illinois.
- November 1979–July 1980: administered a subcontract with Colby Community College, Colby, Kan-

sas, that supported the publication of the college's *A Learning Guide for Alcohol Fuel Production*, a text generated out of the college's week-long workshops that began in May 1979.

- February 22, 1980: hosted one-day meeting of selected two-year college Alcohol Fuels Training Program grantees to discuss their progress to date, identify problems, and prepare recommendations (for USDOE and AACJC) for program improvement; at AACJC in Washington, D.C.; report is available.
- July 1980–present: co-sponsored with the National Gasohol Commission, Inc., Lincoln, Nebraska, a series of three two-and-one-half day Alcohol Fuels Seminars for two-year college faculty and administrators; seminars were held in Fort Worth, Texas (August 6–8, 1980), Cincinnati, Ohio (September 10–12, 1980), and Columbia, South Carolina (February 3–5, 1981, in concert with Midlands Technical Institute).
- December 12, 1980: organized and moderated one-day meeting of five college officials and other organization representatives who had developed alcohol fuels curricula or who were preparing such programs; at AACJC in Washington, D.C.; report is available.
- March 6, 1981: organized and moderated one-day meeting of alcohol fuels experts and educators to discuss production projections, manpower needs, and the role of two-year colleges.

This special issue paper is an attempt to capture in brief form some of the important considerations that were raised in these various activities. In large measure the paper's substance comes from the March 6, 1981, discussion, a meeting designed to help shape this essay. The paper is an attempt to offer colleges state-of-the-art

thinking about alcohol fuels as a base upon which colleges can determine what roles they might assume in providing local alcohol fuels education programs.

The participants in the March 6 meeting were:

James H. Tangeman, President
Colby Community College
Colby, Kansas

Robert L. Poorman, President
Lincoln Land Community College
Springfield, Illinois

Keith Allen, Director, Ag Energy
State Fair Community College
Sedalia, Missouri

Myron Reaman, Chief Executive Officer
National Gasohol Commission, Inc.
Lincoln, Nebraska

Jay Martin, Director of Educational Services
National Gasohol Commission, Inc.
Lincoln, Nebraska

Brian Muller, Rural America
Washington, D.C.

Joanna R. Little, Research Assistant
Oak Ridge Associated Universities
Oak Ridge, Tennessee

Pete Mourning, Information Systems Division
Solar Energy Research Institute
Golden, Colorado

Steven J. Winston, Energy Incorporated
Idaho Falls, Idaho

David E. Hallberg, President
Renewable Fuels Association
Washington, D.C.

Lawrence Akers, Program Manager, USDOE
Washington, D.C.

James R. Mahoney, AACJC

A draft of the paper was shared with the participants for their comments and suggestions.

Emmer

Triticum Dicoccum

Introduction

> **There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Machiavelli, *The Prince*, 1532.**

It may be an understatement to suggest that the alcohol fuels industry is in flux. Like all emerging issues, it is bothered by the conflicting contentions of proponents and opponents and by the vagaries of events and circumstances surrounding them. In alcohol fuels the vagaries are multiple. They include:

- Diametrical shift in federal government interest and support
- Illegal advantages taken by charlatans (see *Wall Street Journal*, March 10, p. 56)
- Conservatism of financial institutions and the construction industry
- Uncertainty of end-use markets and the underdevelopment of these markets (distillers dried grain, auto conversion, diesel conversion, etc.)
- Variability of feedstocks regionally and the sometimes widely fluctuating prices of the feedstocks
- Lapses in technology (municipal solid wastes and cellulosic conversion)
- Reluctance of engine manufacturers to make alcohol-burning engines available in this country, engines that are currently being built for foreign countries (Brazil, for example)
- Petroleum reserves currently at the highest level in history
- General public suspicion that there is no liquid fuel shortage in this country, that the "shortage" has been manufactured by large energy firms and the federal government in collaboration

- General public naivete about alcohol fuels
- General stability of gasoline prices (before deregulation), the easy availability of gasoline and diesel, and the recent announcement (*Washington Post*, March 13, 1981, p. D-2) that large fuel companies are offering two to four cent rebates per gallon on some purchases
- Confusion created by the food/fuels and energy balance controversies
- Conflicting assessments from various sources (community colleges—universities, oil industry—agriculture industry, U.S. Department of Energy—U.S. Department of Agriculture, etc.)
- Escalating loan interest rates
- General fear of trying something new

Until recently alcohol fuels supporters have used economics arguments to justify American investment in the industry. Now two other tacks have been introduced: alcohol as a means of enhancing national security (alcohol as an American fuel) and alcohol production as a trigger for rural revitalization.

American energy development has evolved to huge, centralized organizations that produce a limited variety of energy forms. The installations are thus easy targets for radical bombings, terrorist attacks, and enemy assaults. In *Energy, Vulnerability, and War*, a report produced by the Energy and Defense Project and supported by the Federal Emergency Management Agency, the writers state that 10 Russian SS18's (the largest Soviet intercontinental ballistic missile) carrying eight multiple warheads each could destroy 70 percent of all American energy supplies in a single attack, effectively shutting down this country and crippling our national defense. A decentralized energy system, with production operations in virtually thousands of locations (communities, states, and regional centers, etc.), making a greater vari-

ety of energy supplies (ethanol, methanol, methane, solar, etc.) would be much less open to this sort of attack. Further, the flow of American dollars to foreign countries to purchase liquid fuels (approximately $90 billion last year or $410 for every American citizen or $171,232.87/minute for the year) would be significantly reduced. The implications of the dollar flow for American independence and individual freedom and safety are obvious. Without substantial development and production of American energy sources (particularly liquid fuels), both fossil fuels and renewables along with continuing conservation savings, the flow of these dollars will continue—at an increasing rate.

The second new argument being introduced by alcohol fuel supporters is that alcohol fuel production in rural areas can trigger economic development and lead to rural revitalization.* The need for such revitalization is captured in part by the following details:

- While rural America comprises 27 percent of the U.S. population, 42 percent of all low income households exist in these areas.
- In Nebraska, only 14 communities have a positive cash flow; that is, most communities in the state are sending more dollars out of their areas for goods and services than are being returned.
- In Iowa, $5.1 billion was exported out of the state last year for energy supplies, a figure that trans-

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*** It should be noted that alcohol fuels production is not just a rural issue. It has important implications for urban areas. The U.S. National Alcohol Fuels Commission reported that the 150 largest cities in America could produce 10 billion gallons per year of alcohol fuel from municipal solid waste by the year 2000. In the face of changing urban demographics (population losses and aging citizens with lower incomes, as reported in 1980 census), smaller tax bases, higher energy costs, among the other conditions, alcohol fuel plants in the cities have the same potential as they have for rural areas.**

lates into 300,000 lost jobs.

- Nationally, transportation costs represent 80 percent of the price for foodstuffs; the average distance a food item travels is 111 miles.
- 75 percent of American goods are produced by large corporations. Increasing transportation costs will require the corporations to reduce the distances from which they draw their raw materials, thus leaving many rural areas without markets for their products.

Advocates of alcohol fuel production suggest that these enervating circumstances can be reversed with the aid of the construction and operation of community alcohol fuel plants. With the plants as triggers, integrated energy systems at the community level can be created. The success of this model can lead to the creation of other cooperative systems, including food and materials processing operations, and eventually toward a self-sufficient community. This scenario presents one best-case possibility. At this point, its creation details are not as important as the significant problems it addresses.

Production Projections

> **New opinions are always suspected, and usually opposed, without any other reason but because they are not already common. John Locke, *Essay Concerning Human Understanding*, 1690.**

Anything new creates opponents and proponents. Generally the opponents assume their positions essentially on the grounds that a thing is new, different from the way things are generally done. The opponents have some investment, in academic training, in professional focus, or in cash in the "old way." The proponents, on the other hand, find opportunity in the new for the same reasons that the opponents find disadvantage. The result is that in their respective negative and positive zeal actual conditions are exaggerated. Educators have to find the truth between the extremes before they can shape reasonable programs to address the new ideas.

This analysis applies to the emerging alcohol fuels industry. The situation with this issue is exacerbated by the emotional charges that accompany it: distrust of public officials, skepticism created by those who exaggerate the potential of production, escalating costs, charlatans who have "taken" people through investments in phony enterprises, and the specters that have been raised regarding the capacity of unfriendly countries to disrupt (if not destroy) energy supplies in this country.

The result of these factors is wide-ranging estimates of future production. The Center for the Biology of Natural Systems, St. Louis, Missouri (reported in *American Jobs From Alcohol Fuel*), suggests that 50 billion gallons of ethanol per year could be produced in this country by the mid-1980's. The Solar Energy Research Institute (SERI) estimates that total production capacity may

reach 3.5 billion gallons by 1986. (See Fig. 1.) SERI's numbers are based upon information received from operators or potential operators of alcohol fuel plants. Data on new installations are added continually.

FIGURE 1*

Selected Data From AF Installations Data Base (as of 3/1/81)

A. Number of installations, capacity volume by stage of operation

	# of Installations	Capacity Volume (Millions GPY)
Under Study	53	740
Being Planned	153	2200
Under Construction	195	444
In Operation	281	115
No Longer Operating	58	1
TOTAL	**740**	**3500**

B. Capacity Volume Online by Year

	1/1/82	1/1/83	1/1/84	1/1/85	1/1/86
Capacity Volume (Millions GPY)	2170	3310	3482	3482	3500

* Provided by the Solar Energy Research Institute

The National Gasohol Commission (NGC) projects a 7.2 billion gallon per year production level in 1986. (See Figure 2.)

FIGURE 2

National Gasohol Commission Projections

Year	Total Gallons per Year
1982	8.9 million
1983	1.8 billion
1984	3.6 billion
1985	5.9 billion
1986	7.2 billion (boosted by first cellulosic conversion plants)
1987	9.6 billion
1988	11.0 billion
1989	13.0 billion (50% of which would be anhydrous—200 proof—for use in gasohol; 50% as a straight fuel—100-190 proof—in alcohol-burning engines)
1990	15.7 billion (boosted by urban/municipal solid waste conversion)

The Commission's figures are based upon the production capacity of approximately 420 projects it has been able to identify and the construction activity that federal support has stimulated. Further, the Commission estimates that 20 percent of the producers will make 80 percent of the ethanol. Thus, much of the production will occur in large plants, ones that will probably be highly automated (like Archer–Daniels–Midland Company in Decatur, Illinois, that currently produces 85

percent of the ethanol made in this country), a fact that has important implications for community college alcohol technician training programs. It may also suggest a conflict with the argument that ethanol production will be a decentralized system, one designed to stimulate rural revitalization. In fact, it may actually reflect the highly centralized operations that characterize existing energy production systems.

To help stimulate the development of community-size plants and to broadcast the economic development potential of alcohol fuels production in local areas, the NGC is offering workshops in 20 states between April and December of this year. Further, the Commission reports that a growing number of developing countries are seeking information about alcohol development, production, and equipment. NGC projects a need for American technicians to serve as technical advisors to these countries, teacher training programs for overseas projects, and space for foreign students in American colleges.

Manpower Needs

Like production estimates, manpower needs assessments for the emerging industry vary widely. State Fair Community College, in preparation for the implementation of an AAS degree program entitled Ag Energy, conducted a national survey of ethanol fuel plants and of organizations planning to produce ethanol. The 1981 survey of 52 different sites revealed that the current producers estimate 50 available jobs for college-trained technicians. The potential future producers projected 397 jobs for college-trained people from 1981 through 1983. These are all in-plant positions. The types of responsibilities the individuals would have were not identified.

In 1980-81 Oak Ridge Associated Universities (ORAU) in Tennessee conducted a study to determine the employment and income impacts of biomass energy development. On-site interviews with on-farm ethanol producers and other larger producers resulted in case studies. Findings showed that plant managers are being paid $5-$6/hour and plant operators $4-$5/hour. ORAU follow-up telephone calls indicated that trained community college employees might expect to receive from $.50 to $1.50 per hour more.

ORAU's manpower analysis is captured in Figure 3 on the following page. The numbers show that at the five billion gallon production level between 9,100 and 20,000 plant workers will be required. More workers will be required in the transportation and harvesting areas. Figure 4 suggests that few of the plant personnel will require concentrated ethanol fuel production education, that many workers fall in standard occupational categories (welders, electricians, pipefitters, etc.), and that only a small percentage of the workers need education beyond the high school level. Further, the implication is that plant owners may want to do most of the

FIGURE 3*

Table III–1. National Employment Related to Alcohol Plant Operation, Transportation Feedstock Supply at Various Levels of Production

Annual Production (Mil. Gal.)	Employment (worker-years) Alcohol[a] Plant Workers	Truck Drivers	Total	Employment (worker-years)[c] Production and Harvesting of Feedstock Corn	Milo	Wheat
100	182-400	63	245-463	1,280	2,560	3,200
300	546-1,200	189	735-1,389	3,840	7,680	9,600
500	910-2,000	315	1,225-2,315	6,400	12,800	16,000
1,000	1,820-4,000	630	2,450-4,630	12,800	25,600	32,000
2,000	3,640-8,000	1,260	4,900-9,260	25,600	51,200	64,000
5,000	9,100-20,000	3,150	12,250-23,150	64,000	128,000	160,000
8,000	14,560-32,000	5,040	19,600-37,040	102,400	204,800	256,000
10,000	18,200-40,000	6,300	24,500-46,300	128,000	256,000	320,000

[a] Number required is dependent upon size of plants built. If small plants are built, larger number will apply.
[b] Assumes each driver makes 3 deliveries per day and separate trucks are used for grain and DDG.
[c] Assumes a full year's employment for a hired farm worker is completed in 6 or 7 months and involves an average of 1,250 hours. This is consistent with information reported in Bureau of Labor Statistics, Occupational Outlook Handbook, Government Printing Office, Washington, D.C., 1979.

* Direct Employment and Earnings Implications of Regional Biomass Energy Utilization: New England and the Cornbelt States.

FIGURE 4*

Classification of Job Positions in the Alcohol Fuel Industry

Occupational Category	Education and Training Required	Grain and Alcohol Plant Operation and Maintenance
Engineers and Scientists	Generally requires a four-year Bachelor's Degree but may require post-graduate study	Chemist, Design Engineers
Support Workers	Generally requires at least a two-year Associate Degree for Technicians; Technologist requires a four-year Degree	Lab Technicians
Blue Collar Workers	Generally requires an Apprenticeship	Management, Administrative, Sales, Boiler Operators, Welders, Pipefitters, Electricians
Semiskilled Jobs	May require High School Education	Office Workers, Janitors, Process Operators, Truck Drivers, Assembly Workers, Farm Laborers, Sales People

Source: Organizational scheme developed by John Woodburn, *Opportunities in Energy Careers*, VGW Career Horizons, National Textbook Company, Skokie, Illinois, 1979.

*** Direct Employment and Earnings Implications of Regional Biomass Energy Utilization: New England and the Cornbelt States.**

special training themselves, on the job.

A third study projects that at the six billion gallon per year production level, 960,000 new jobs will be created by the alcohol fuels industry.

> 409,000 of these jobs would be created over a period of five years with the construction of the plants. An additional 71,000 jobs would be required on a permanent basis to operate, maintain, and supply the plants. Up to 480,000 additional jobs would be created through the multiplier effect when newly employed construction and production workers spend their incomes on consumer goods and services. "Summary," *American Jobs From Alcohol Fuels*, p.1.

The number of plant operation and maintenance jobs would depend on the size of plants constructed. The general rule is the larger the plant the fewer workers needed because of automation. Figure 5 presents an analysis of the direct jobs gained. Figure 6 shows the new jobs associated with plant operation, maintenance, and supply.

FIGURE 5*

Jobs Generated With a $12 Billion Investment In Ethanol Plant Construction (Dry Milling)

Industry	Number of Jobs
Construction	159,970
Fabricated Structural Metal	60,090
Miscellaneous Professional Services (Engineering)	20,550
Basic Steel and Blast Furnaces	15,930
Other Fabricated Metal Products	11,360
Wholesale Trade	8,810
Miscellaneous Business Services	7,900
Retail Trade	5,270
Service Industry Machinery	4,720
Truck Transporation	4,700
General Industry Machinery	4,270
Cement and Concrete Products	3,510
Electric Transmission Equipment	3,340
Special Industry Machinery	2,580
Electric Lighting and Wiring	2,570
New Highway Construction	2,530
Primary Aluminum and Aluminum Products	2,300
Iron and Steel Foundries and Forgings	2,060
Wooden Containers	1,880
Scientific and Controlling Instruments	1,820
Machine Shop Products	1,710
Primary Copper and Copper Products	1,190
Millwork, Plywood and other Wood Products	1,190
Electrical Industrial Apparatus	990
Miscellaneous Stone and Clay Products	830
Material Handling Equipment	740
Farm Machinery	650
Household Appliances	630
Typewriters and Office Equipment	520
Computers and Peripheral Equipment	450
Hotels and Lodging Places	390
Sawmills and Planing Mills	350
Electronic Components	250
Heating Apparatus and Plumbing Fixtures	240
Metal Working Machines	230
Construction, Mining and Oilfield Machinery	210
Stone and Clay Mining	170
Logging	120
ALL OTHER	72,020
TOTAL JOB GAIN	**409,000**

* American Jobs From Alcohol Fuels

FIGURE 6*

Jobs Generated Annually From Operating, Maintaining, and Supplying the Alcohol Fuel Plants

Personnel for Plant Operations	31,800
Food Products (Yeast)	300
Industrial, Organic, and Inorganic Chemicals (Enzymes)	600
Truck Transportation	8,380
Wholesale Trade	7,010
Coal, Electricity, Gas	8,880
Other	13,970
Total Jobs Gained	70,940

* American Jobs From Alcohol Fuels

Role of Community Colleges

As shown above, production and manpower projections vary greatly among sources. What does not vary, however, is the clearly modest need, no matter how much alcohol is produced in this country, for specially trained, narrowly focused alcohol fuels technicians. If colleges do move in this direction, the likelihood is that a good number of graduates will find themselves in unhappy circumstances: unemployed, underemployed, mis-employed, and disgruntled with the college that, by implication, led students to believe jobs waited for them upon graduation.

While there may not be a need for an expansive number of alcohol fuels technicians, there is a need for some, and there will continue to be a need if the fledgling industry develops. The suggestion made by community college representatives is that some few community colleges might serve as regional training centers, with each center assuming the responsibility for specific portions of the specialty training. One college, for example, might specialize in the distillation/fermentation process; another, engine conversion procedures. Still other possibilities for special focus areas are: microbiology/chemistry, heat exchange technicians, laboratory technicians, electricians, agriculture marketing technicians, and managers. The value in such an approach is that it takes advantage of the expertise of faculty currently employed by the colleges, it reduces the investment (in personnel, equipment, materials, etc.) required by individual colleges, and it makes it more convenient for individuals (new students, workers interested in new careers, and craftsmen who are in need of skills upgrading) to secure the particular education they desire. It also avoids the danger suggested above; that is, producing graduates from AAS degree programs who are un-

Potato

Solanum Tuberosum

able to find suitable jobs in the industry. Until the industry is developed, it would be much more reasonable for a college with special interest in alcohol fuels production, and special capacity, to concentrate on separate components of the field.

Further, preliminary college investigations of new plant operations indicate that plant operators do not know precisely the skills they want their employees to have. Their experience is too limited to allow them to make these judgments. The best guess now is that what would be most useful to them is a person who could serve as a quality control manager, a generally trained person who knows the production process, can troubleshoot operations, and is knowledgeable about energy management principles.

For those colleges not already involved in some form of alcohol fuels education, one college president suggested a three-phase approach to development: (1) offer general information workshops for farmers and other groups in the community as a way of imparting up-to-date and factual details about alcohol fuels production and use; (2) if the response to the workshops warrants further offerings, develop courses, sequences of courses, or certificate programs; if the response does not warrant further development and there is little abiding interest in the workshops, no further activity should be conducted; (3) again, if interest supports it, a full AAS degree program should be introduced.

This phased scheme is a traditional means through which new programs are introduced in colleges. A standard part of this scheme is the use of curriculum advisory committees, composed of local business people who are familiar with the field and who might eventually employ graduates of the program. Such committees should be used for these programs. In both phases (1) and (2), the regional specialty approach should be at-

tempted. And, because of the uncertain employment picture, the most logical approach for a college is to offer an education program that produces an energy generalist.

Such a program is planned for introduction this fall at State Fair Community College. The Ag Energy AAS degree curriculum has seven core courses. The program is interdisciplinary, with the core courses taught in four different departments. Chemistry is taught through the Chemistry Department, with all demonstration examples related to agriculture energy. Biology is taught in the Biology Department. The Building Trades Department offers the Building Trades course, with focus on solar. The four remaining core courses—Alcohol Fuels I (3-credit course) and II (96-hour hands-on course), Introduction to Ag Energy (3-credit course), and Ag Energy Production (3-credit course)—are offered through the Agriculture Department. Stress is placed on integrated energy systems. The program includes instruction in methane, alcohol, solar, and other energy sources derived from agricultural products. The remaining courses in the degree program concentrate on basic skills instruction in agriculture, liberal studies, and the sciences. Graduates of the program will be ready to manage their own farms on which they might install integrated energy systems or to enter one or another of the energy industries, or other related industries for which their basic skills will qualify them. The curriculum stresses basic science/agriculture/communications/management competencies, ones that prepare students for a variety of occupations, thus improving their employability.

These education program suggestions are not new to two-year colleges. They are approaches that the colleges have applied before. They are based on the traditional formula for program creation in occupational areas: industry/business manpower needs drive training

programs. The formula describes an intimate marriage between local business and the community college, a union designed to vitalize the local economy and to improve the quality of life in the area.

While the formula is undeniably effective and logical, colleges should not be wedded only to this approach. Colleges should examine not only what exists but also what might exist (or what needs to exist) for the betterment of the community. In regard to energy, for example, colleges might take the responsibility for presenting alternate energy futures for citizens in its service district. It might assume a primary role in examining the possibilities of collaboration among various community segments in establishing some form of community energy enterprise. And, for alcohol fuels, it might lead the way in broadening the concept of alcohol production and integrated energy systems as essentially an individual farm activity by demonstrating its potential as a community enterprise. With this approach, the college becomes much more than a manpower training center. It becomes a locus for community growth. Because the college is a center of learning (sometimes the only center within hundreds of miles, particularly in rural areas), because its personnel are experts in an assortment of disciplines, because its function is to provide quality learning opportunities of many sorts for community residents, and because the college has an important role to play in community development (economic, social, environmental, recreational, among others), a legitimate function for the college may be to make the community aware of matters about which it may not have asked to be informed. It may be the college's responsibility to provide the community with objective, factual details about an issue to help citizens make their own informed decisions concerning the importance of the issue for its well-being.

Jerusalem Artichoke

Helianthus Tuberosus

The energy issue offers a case in point. According to the knowledgeable people who attended the March 6 meeting at AACJC, the construction and operation of an alcohol fuel plant in a community could have significant long-term positive effects upon the general economy of the area. In a number of slow, complicated, and uncertain steps, a local community plant has the potential of leading the way toward economic development and local self-sufficiency. As suggested earlier, a community-size alcohol fuel plant could expand directly and indirectly the employment base; it could encourage the development of related energy businesses (methane generation, solar applications, among others); it could lead to the establishment of an assortment of service businesses (engine conversion, supply companies, food processing firms, among others); and it could set a pattern that would reverse the dependence of local communities on huge, centralized process and handling operations distant from the origin of the raw materials, a pattern set in motion decades ago. Its reversal may appear to be an illusion. But knowledgeable people think that it is a possibility, and that alcohol fuel production plants in local areas can be one of the triggers for change.

If such a change is beneficial, if it addresses one of the serious handicaps that continue to weaken the health of local areas, and if the philosophy of community colleges is taken seriously, then colleges do have an obligation to contribute what they can to help. Colleges' most valuable contribution is the delivery of reliable information to community leaders and to the general population. By delivering such information, colleges could help to eliminate the vagaries noted earlier that affect the industry's development.

One of the most important causes of the industry's halting nascence is the reluctance of financial institutions and construction enterprises to invest. To this

point colleges and legitimate advocates of alcohol fuel production have stated that financial institutions are not willing to risk capital on unproven business ventures. They are most comfortable with the familiar (real estate, established firms, etc.). They are not convinced of the potential that alcohol fuel plants have in turning a profit, nor are they aware of the residual effect on the general economic health of the community that is represented by the industry. Before the value of this fledgling industry can be tested, financial organizations have to be convinced to release venture capital for construction. Then, construction firms must be induced to build the plants.

Colleges could take advantage of an assortment of opportunities to share with these two audiences facts that could diminish their reservations. Presentations to local Chambers of Commerce, Rotary Clubs, Lions Clubs, Future Farmers of America meetings, and other public forums might be used by college faculty and administrators to provide accurate information about the potential of alcohol fuel production and its importance locally as well as nationally.

Even before this can happen, educators have to be educated. For this reason, some of the meeting participants suggested that workshops for educators (like those previously offered by AACJC and NGC) should continue to be offered across the country, so that dependable, credible experts can present the facts about alcohol fuels.

If the crucial audiences are effectively addressed, if more plants are financed and built, the need for informed and skilled plant workers will increase and the demand for additional college programs will expand. Only through this evolution will anything more than familiarity modules or courses in college be sensible.

Conclusion

As has been noted, the details of this special issue paper were drawn from the March 6, 1981, discussion at AACJC. In large measure, this is a report of that meeting. If at points this paper appears to be a polemic for alcohol fuels, it is because strong proponents (some with commercial interests) attended the meeting.

The issues raised concerning two-year college roles in alcohol fuels production are broader than alcohol fuels. They apply to all energy programming. National, regional, and local energy circumstances touch everyone's lives. The circumstances are too important for two-year colleges to ignore in their program offerings. Each college must decide the manner in which it will respond: infusion or discrete modules in standard curricula, courses, sequences of courses, certificate/degree programs, options in related programs, public forums/workshops/seminars, outreach programs to secondary schools, specialty programs in concert with other colleges, information resource centers, or other means. The college's response should be dictated by community need as revealed in various assessment activities (formal evaluations, expert opinion offered through community leaders in the government/industry/association sectors, among others). It should also be dictated by the college's vision, a vision that might require the college to assume an advocacy position for the development of one or another energy resource.

> **But the bravest are surely those who have the clearest vision of what is before them, glory and danger alike, and yet notwithstanding go out to meet it. Thucydides, 460-400 B.C.**

Orange

Citrus Sinensis

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Resources

American Jobs From Alcohol Fuel, Marion Anderson and Carl Parisi, 13-page booklet that shows over 960,000 new jobs would be created by the installation and operation of $12 billion worth of alcohol fuel plants making six billion gallons of fuel per year; Employment Research Associates, 400 South Washington Avenue, Lansing, Michigan 48933, 517/384-7655; $3.00/single copy, reduced cost for multiple copies.

Fuel Alcohol: An Energy Alternative for the 1980's, 150-page final report of the U.S. National Alcohol Fuels Commission includes findings and recommendations regarding possible alcohol fuels contributions to national domestic energy supplies, costs/benefits of developing alcohol fuels, end product use, and federal policies/programs that affect development; U.S. National Alcohol Fuels Commission, Public Affairs, 412 First Street, S.E., Washington, D.C. 20003, 202/426-6490; single copies free while supplies last; after March 1981, copies available at Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, stock number 052-003-00792-4; $4.25.

Energy, Vulnerability, and War, Wilson Clark and John McCasker, 350-page report of the Energy and Defense Project, supported by the Federal Emergency Management Agency, examines the weaknesses of this country's current energy production and storage systems in terms of national defense and preparedness; National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, 703/487-4650; stock number A09-4319; $24.50.

Energy Education Programs: Perspectives for Communi-

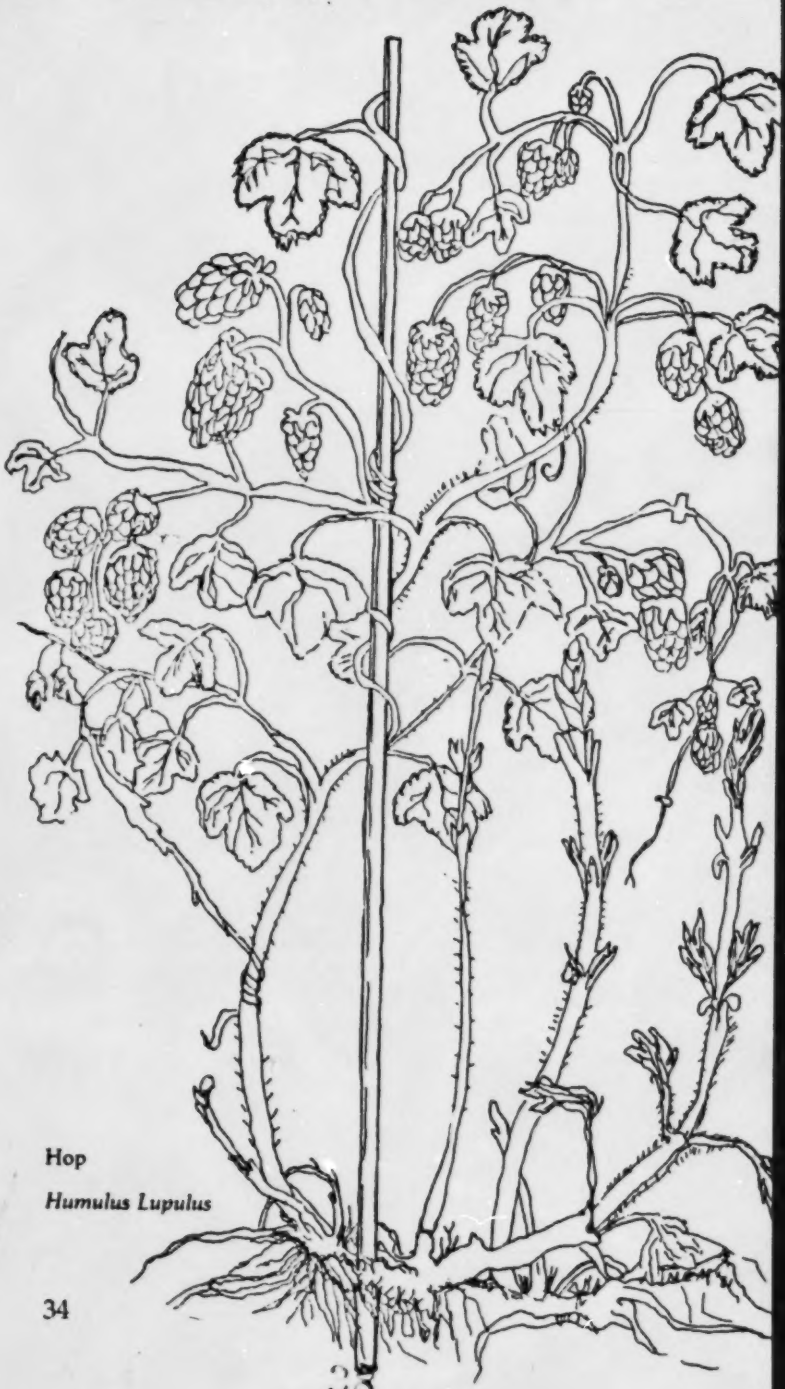
ty, Junior, and Technical Colleges, Mary Ann Settlemire, 35-page booklet containing overviews of U.S. energy use history, recent federal legislation, manpower projections, community college roles, program implementation problems, and references to program funding materials; AACJC Energy Communications Center, One Dupont Circle, N.W., Suite 410, Washington, D.C. 20036, 202/293-7050; free while supplies last.

A Learning Guide for Alcohol Fuel Production, 348-page technical resource text stressing perspectives, decision-making, operations and consumption, and principles of alcohol fuel production, generated out of five-day international workshops conducted by the college; Colby Community College, 1255 South Range, Colby, Kansas 67701, 913/462-3984; $25/single copy, reduced price for multiple copies.

Alcohol Fuels: Use, Principle, Economics, Steven J. Winston, student's text and teacher's guide focusing on 12 alcohol fuels production topics, designed for use in two-year colleges with substantial technical appendix; Solar Energy Research Institute, Document Distribution Service, 1617 Cole Boulevard, Golden, Colorado 80401, 303/231-1158; single copies free.

Direct Employment and Earnings Implications of Regional Biomass Energy Utilization: New England and the Cornbelt States, Wayne Stevenson, *et. al,* Oak Ridge Associated Universities, 200-page draft report of one-year investigation that included 145 site visits to biomass operations and examination of 189 resources; 30 site visits were to alcohol plants; case study format; Department of Energy, Technical Information Center, Box 62, Oak Ridge, Tennessee 37830, 615/574-1000; available April 1981; cost not yet determined.

Ethanol Fuels Handbook for Community and Small-Scale Producers, Peggy Wheeler with Brian Muller and Charles Banzet, 200-page resource guide, organized by region, for initiation and operation of alcohol plants, with special stress on involvement of low and moderate income people; Rural America, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036, 202/659-2800; available April 1981 at $4-$5/copy.



Hop

Humulus Lupulus

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